Design Fundamentals Of Post Tensioned Concrete Slabs

Post-Tensioned ConcretePCI Post-tensioning ManualUnbonded Tendons in Post-tensioned ConstructionStructural Fire Performance of Contemporary Post-tensioned Concrete ConstructionPrestressed ConcretePost-tensioning in BuildingsDesign of Post-tensioned SlabsPost-Tensioned Concrete FloorsRecommendations for the design of flat slabs in post tension concrete using unbonded and bonded tendonsAnchorage Zone Reinforcement for Post-tensioned Concrete GirdersPost-Tensioned Concrete: Principles and Practice, Third EditionPrestressed ConcreteThe Design of Post-tensioned Concrete Flat Slabs in BuildingsThe Design of Post-tensioned Concrete Flat Slabs in BuildingsExtending Span Ranges of Precast Prestressed Concrete GirdersRecommendations for acceptance and applications of post tensioning systemsThe design of post-tensioned concrete flat slabs in buildingsDurability of Post-tensioning TendonsCharacteristics of Reinforced and Post-tensioned Concrete Slabs During ConstructionArchitectural Graphic Standards K. Dirk Bondy Prestressed Concrete Institute Arthur E. Andrew John Gales fib Fédération internationale du béton Post-Tensioning Institute Martin Williams FIB – International Federation for Structural Concrete John Edward Breen K. Dirk Bondy N. Rajagopalan Concrete Society. Working Party on Post-Tensioned Flat Slab Construction Concrete Society. Working Party on Post-tensioned Flat Slab Construction Reid W. Castrodale FIB – International Federation for Structural Concrete Concrete Society. Post-Tensioned Flat Slab Construction Working Party fib Fédération internationale du béton Khin Thandar Soe The American Institute of Architects

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textbook and design guide for the structural design of post tensioned concrete

this title provides an assessment of pre stressed concrete unbonded tendons properties of materials losses in pre stress suitable types of structures design of floor and roof slabs of buildings using unbonded tendons design of other structures using unbonded tendons work on site and post tensioning systems

this springerbrief equips readers to develop defensible fire safety designs for a range of concrete structures it identifies current gaps in the research and provides a more complete understanding of the structural and thermal response of contemporary post tensioned pt concrete structures to fire the brief includes chapters on contemporary construction using pt concrete previous structural fire test research programs recent research programs real fire case studies and current research needs it explores the progression of pt concrete structures looking at the sustainability and aesthetic benefits the ongoing development of stronger concretes and best practice guidance for improving safety in the event of fire designed for practitioners and researchers in fire engineering this brief is a valuable tool for those studying the impact of fire on concrete fire safety designs and building safety optimization advanced level students in civil engineering will also find the content useful

post tensioning and grouting operations can be dangerous if the required care is not taken in planning in site preparations and in execution for prestressed concrete a good working environment is also a prerequisite for high quality many accidents in this type of work may be attributed to a lack of training poor supervision poor planning or over familiarity with the process this guide to good practice highlights important safety measures which are particularly applicable to prestressed concrete dealing with precautions necessary for post tensioning and grouting operations on site

the development of prestressing technology has constituted one of the more important improvements in the fields of structural engineering and construction referring particularly to post tensioning applications it is generally recognized how it opens the possibility to improve economy structural behaviour and aesthetic aspects in concrete solutions in spite of the simplicity of its basic concepts and well known advantages the application extent of post tensioning solutions cannot be considered harmonized in the different areas and structural applications in fact for various reasons it appears that the potential offered by prestressing is far from being fully exploited especially in building structures field in many cases where post tensioning would provide a visibly superior solution it happens after all that a more conventional non prestressed solution is often selected the main objective of this fib technical report is therefore to show the benefits of using post tensioning for the more common practical applications in concrete buildings the document is mainly addressed to architects contractors

and owners it is also drafted with the goal of motivating building designers to use post tensioning basic design aspects related to prestressing effects and design criteria are summarized and conceptual design aspects are emphasized a set of practical examples is presented showing the adopted solutions and their advantages when meeting the requirements of specific problems the selected examples were precisely not chosen because they are outstanding structures as a matter of fact post tensioning principles and technology can be used in any structure independently of its importance covering a wide range of building structural applications improving the structure quality and promoting concrete as a structural material the advantages of using post tensioning concerning structural behaviour economy detailing and constructive aspects are illustrated by the presentation of several existing structures most of them designed by working party members general design calculations are not presented but design results showing the improvement in structural behaviour are illustrated

post tensioning is the most versatile form of pre stressing a technique which enables engineers to make the most effective use of the material properties of concrete and so to design structural elements which are strong slender and efficient design in post tensioned concrete is not difficult and if done properly can contribute significantly to the economy and the aesthetic qualities of a building post tensioned floors have found widespread use in office buildings and car park structures and are also frequently employed in warehouses and public buildings however in spite of this most prestressed concrete texts devote comparatively little attention to floors concentrating instead on beam elements this book answers the need for a comprehensive treatment of post tensioned floor design

these recommendations present a guide to the design of two way spanning post tensioned concrete flat slabs using unbonded or bonded tendons recommendations purely related to the use of unbonded tendons are clearly marked these recommendations are intended only for the design of post tensioned flat slabs in buildings and do not include the use in bridges post tensioned concrete construction can be defined as unbonded or bonded depending on whether the tendon ducts are filled with a cement grout in order to provide a bonded structure or whether the tendons are suitably coated and wrapped or greased and plastic covered unbonded while in a number of countries e g united states and canada economic and construction considerations have resulted in the selection of unbonded tendons in other countries the use of the traditional bonded tendons is favoured e g australia some of the advantages claimed for the use of unbonded tendons can be summarized as follows extremely low friction values tendons are fully protected against corrosion during construction maximum possible tendon drape due to the small diameter of the tendon this is of major importance in slender structures such as flat plates simple and fast placement of the tendons avoidance of grouting operations when tendons are grouted after stressing the claimed advantages are particularly that the bond between the concrete structure and the tendons increases the ultimate strength and less reliance is placed on the long term adequacy of the anchorage

the book combines history with academic notes for use at the university level presenting design

examples from actual jobs with applications and detailing for the practicing engineer chapter 1 tells the history of post tensioned concrete as only ken bondy can tell it chapters 2 8 are the notes dirk bondy uses to teach design of prestressed concrete structures at ucla and cal poly san luis obispo chapters 9 13 are design examples that address many of the decisions faced by practicing engineers on typical projects chapters 13 14 cover the art of detailing and observing the construction of post tensioned concrete this knowledge was obtained over many years of working on our own projects and listening and learning from the the pioneers of post tensioned concrete chapter 15 covers the slab on grade industry which represents more sales of post tensioning tendons than all other post tensioning applications combined chapter 16 discusses the challenging application of post tensioning external post tensioning

simple design low life cycle costs and fast easy construction are just a few of the reasons that make prestressed concrete attractive for use in bridges water and wastewater storage tanks ocean dock construction flooring and more prestressed concrete covers the fundamentals of prestressing systems of prestressing losses the ultimate strength of sections in flexure shear and torsion anchorage zone stresses limit state concepts and holistic design of prestressed concrete elements the book also provides information on design of determinate structures and indeterminate structures beams and frames inclusive of cable profiling it discusses special structures like pipes water tanks etc and the behavior of composite structures such as precast prestressed concrete beams cast in situ r c slab along with its design provisions prestressed concrete is a valuable guide for practicing engineers students and researchers

at head of title national cooperative highway research program

in some countries durability problems with post tensioning tendons have in the past led to fairly restrictive regulations improvements to execution procedures have been developed since and new or improved prestressing systems have been proposed too this development was of course subject of discussions in fib commission 9 reinforcing and prestressing materials and sytems and in iabse working commission 3 concrete structures it was decided to organise a workshop with the aim to review the different aspects of the problems encountered and to discuss solutions available today keynote speakers from various countries were invited to contribute their papers are published in this bulletin grouped together under the following themes inventory and condition 6 papers investigation and repair 5 papers technical progress 4 papers strategies for improvement 6 papers supported by the international federation for structural concrete fib and the international association for bridge and structural engineering iabse the workshop took place on 15 16 november 2001 at ghent university celebrating the 75th anniversary of the magnel laboratory for concrete research whose director also chaired the scientific committee and edited the bulletin it needs to be emphasised that in the bulletin invited experts present their individual views although not yet discussed in any of the association s working bodies the highly topical contents of the bulletin is believed to be of general interest to fib s members and to document a starting point for future work in this field therefore the council of fib agreed to exceptionally publish these papers within fib s series of bulletins

the temporary formwork system is one of the most important features of construction in terms of safety and economy especially in multi storey buildings for which post tensioned slab structures are very common however general practices for formwork systems including removal times in both post tensioned and reinforced concrete buildings have to comply with the standards established for reinforced concrete structures although a recommended formwork removal times for reinforced concrete structures is specified in these standards such as in table 5 4 2 as 3610 there is no such table which can be easily put into practice by the industry in post tensioned structures nevertheless some standards such as as 3600 and aci 347r specify certain requirements for removal of the formwork system from under a post tensioned slab post tensioning causes the negative curvature of a slab segment to increase which increases its cracking moment capacity in the service load range this may allow formwork supports to be removed earlier from post tensioned than from reinforced concrete structures in order to improve current formwork operating practices in post tensioned building construction this study has examined the characteristics of reinforced and post tensioned slabs during construction by taking extensive on site measurements data was collected from two post tensioned building constructions in canberra australia a residential 20 storey building and a commercial low rise building the average slab load distribution on a typical suspended post tensioned slab was determined by monitoring the prop forces strains in the slab sections deflections and ambient and concrete slab temperatures over the construction period of four suspended floor levels the slab load distribution is generally represented by the ratio of the applied load to the self weight of the slab and is referred to as the slab load ratio slr there are several methods for estimating the slr for the reinforced concrete multi storey building construction however very little work has been conducted in the area of slr estimation for post tensioned building construction these slr estimation methods are usually applied to all formwork systems adopted by the industry in building construction in order to validate decisions regarding the removal of formwork supports during construction slr estimation methods originally proposed for reinforced iii concrete structures are not necessarily appropriate to post tensioned structures as they behave differently at the early age this work proposes a new slr estimation method designed specifically for post tensioned structures it is based on two methods the simplified method used for reinforced concrete structures and kajewski s modified method which has been proposed for post tensioning structures kajewski 1998 an analysis of the collected data is reported and is used in proposing a new slr estimation method which is more suitable for post tensioned structures it is then applied to determine the load distributions of the post tensioned slabs in the five most prominent types of formwork support systems the fundamental concept of this new method is that if the maximum applied load obtained from the calculated slr does not exceed the cracking slab load capacity at the desired removal time the temporary formwork supports may be removed however if it does the slab needs to be supported longer to achieve sufficient strength applying the proposed slr method in the five most commonly employed formwork systems has enabled suitable formwork removal times for post tensioned multi storey construction to be proposed under this proposal the props or backprops at the lowest level of support for a suspended post tensioned slab may be removed one to three days earlier than they are currently depending on the type of formwork system used these proposed removal

times are validated by investigating the serviceable limits of the slabs allowable deflection and cracking moment the particular significance of this work for the construction industry is its potential for improving the economy and speed of construction it also encourages the practice of applying more suitable shoring and reshoring removal time to post tensioned construction a table of prop removal time is provided for the use of post tensioned structures to go along with as 3610 table 5 4 2 which is more suitable for traditional reinforced concrete construction the proposed new slr method offers a greater accuracy in determining the slab load distributions of post tensioned structures in multi storey building construction

since 1932 the ten editions of architectural graphic standards have been referred to as the architect s bible from site excavation to structures to roofs this book is the first place to look when an architect is confronted with a question about building design with more than 8 000 architectural illustrations including both reference drawings and constructible architectural details this book provides an easily accessible graphic reference for highly visual professionals to celebrate seventy five years as the cornerstone of an industry this commemorative eleventh edition is the most thorough and significant revision of architectural graphic standards in a generation substantially revised to be even more relevant to today s design professionals it features an entirely new innovative look and design created by bruce mau design that includes a modern page layout bold second color and new typeface better organized a completely new organization structure applies the uniformat r classification system which organizes content by function rather than product or material expanded and updated coverage of inclusive universal and accessible design strategies environmentally sensitive and sustainable design is presented and woven throughout including green materials leeds standards and recyclability a bold contemporary new package as impressive closed as it is open the eleventh edition features a beveled metal plate set in a sleek black cloth cover ribbon markers included as a convenient and helpful way to mark favorite and well used spots in the book all new material thoroughly reviewed and edited by hundreds of building science experts and experienced architects all new details and content including new structural technologies building systems and materials emphasis on sustainable construction green materials leed standards and recyclability expanded and updated coverage on inclusive universal and accessible design strategies computing technologies including building information modeling bim and cad cam new information on regional and international variations accessibility requirements keyed throughout the text new standards for conducting disseminating and applying architectural research new and improved details with some 8 500 architectural illustrations including both reference drawings and constructible architectural details architectural graphic standards continues to be the industry s leading easily accessible graphic reference for highly visual professionals

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